Two Sides of High Energy Physics

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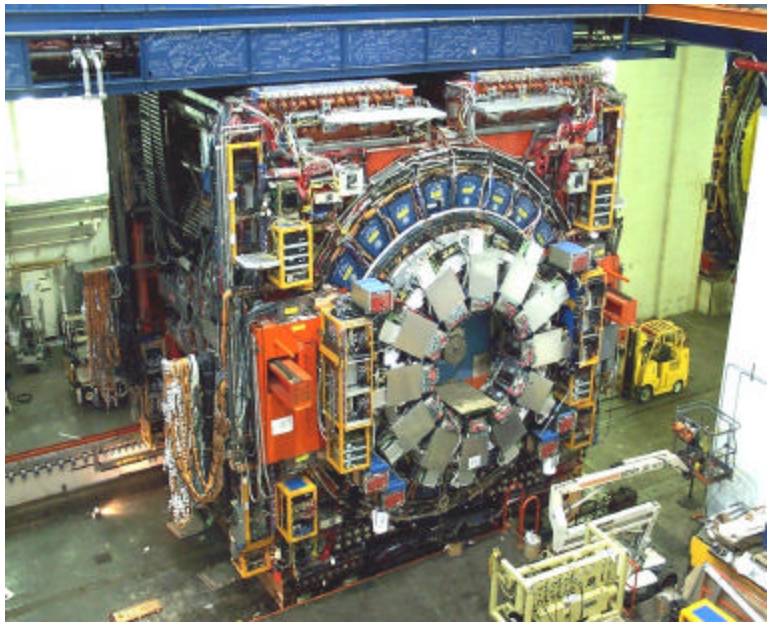
Focus For the Summer

High End and Low End of High Energy Physics



1. Data Analysis – ntuple
   - Adding to and debugging the ntuple, looking for W? e? and Z? ee
2. Hardware – CAEN power supplies
   - Spontaneous transitions – why are they happening and why are they a serious problem?

Ntuple

Work on the Electron and Met Blocks:

1. Filled in missing variables in both blocks
   - Modeled after EmNtupleModule.cc (Run II)
   - Corrections yet to be added
2. Committed them to CVS
3. Examined Z? ee and W? e?

-Need to see if new ntuple can help find these, W and Z bosons will be necessary to probe into new areas of physics

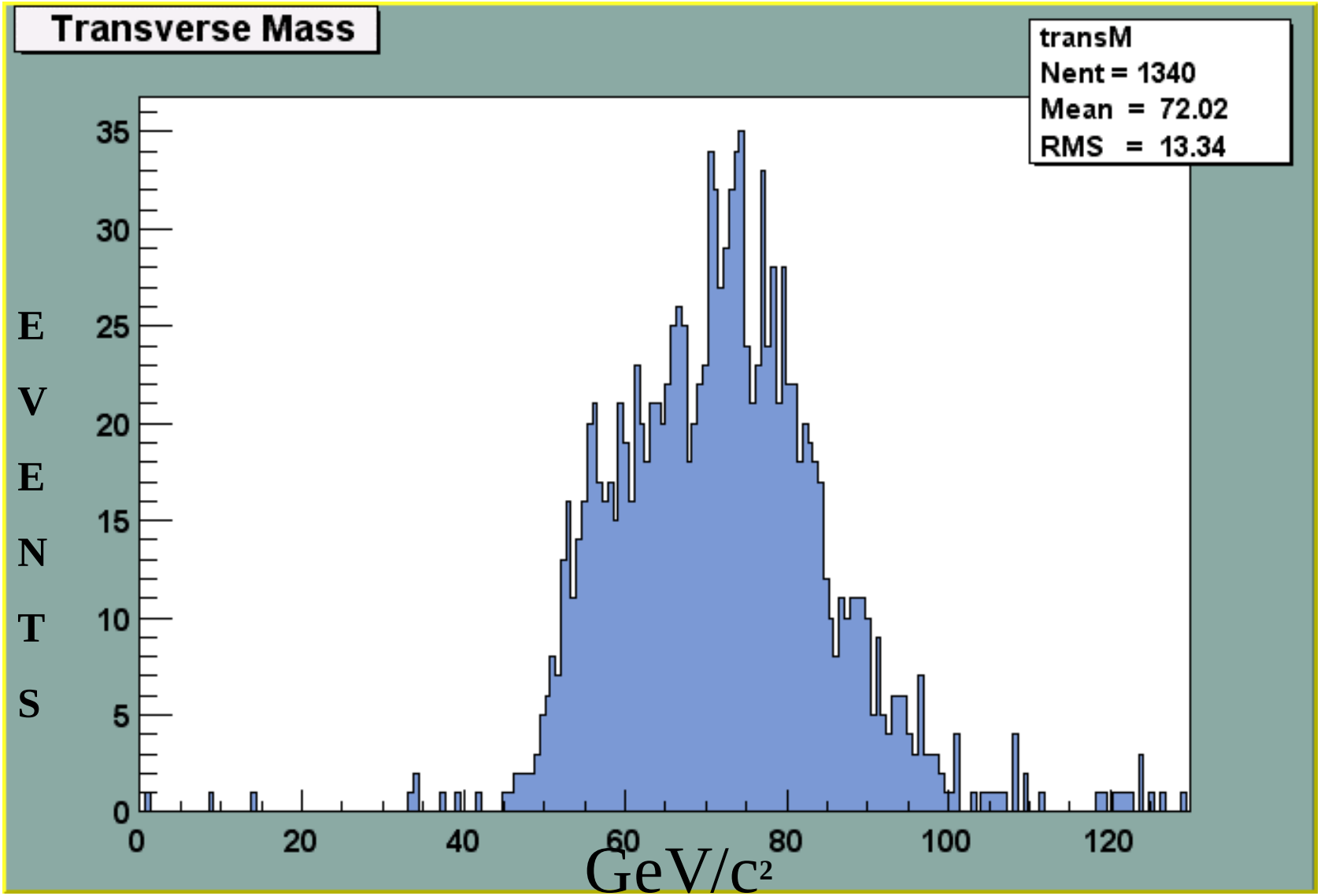
Selection criteria for W? e?

Tight Cuts

- |?| < 1.1 (central e)
- E_T > 25 GeV
- P_T > 10 GeV
- Total Iso < 4 GeV
- E_{had}/E_{em} < 0.05
- 0.5 < E/P < 2.0
- LshrTrk < 0.2
- |? x| < 3.0 cm
- |? z| < 5.0 cm

- X^2_{strip} < 10
- |? z_0| < 60.0 cm
- # Stereo hits > 25
- #Axial hits > 25
- FIDELE = 1
- Missing Et > 25 GeV

Transverse mass from W? e?



Selection Criteria for Z? ee

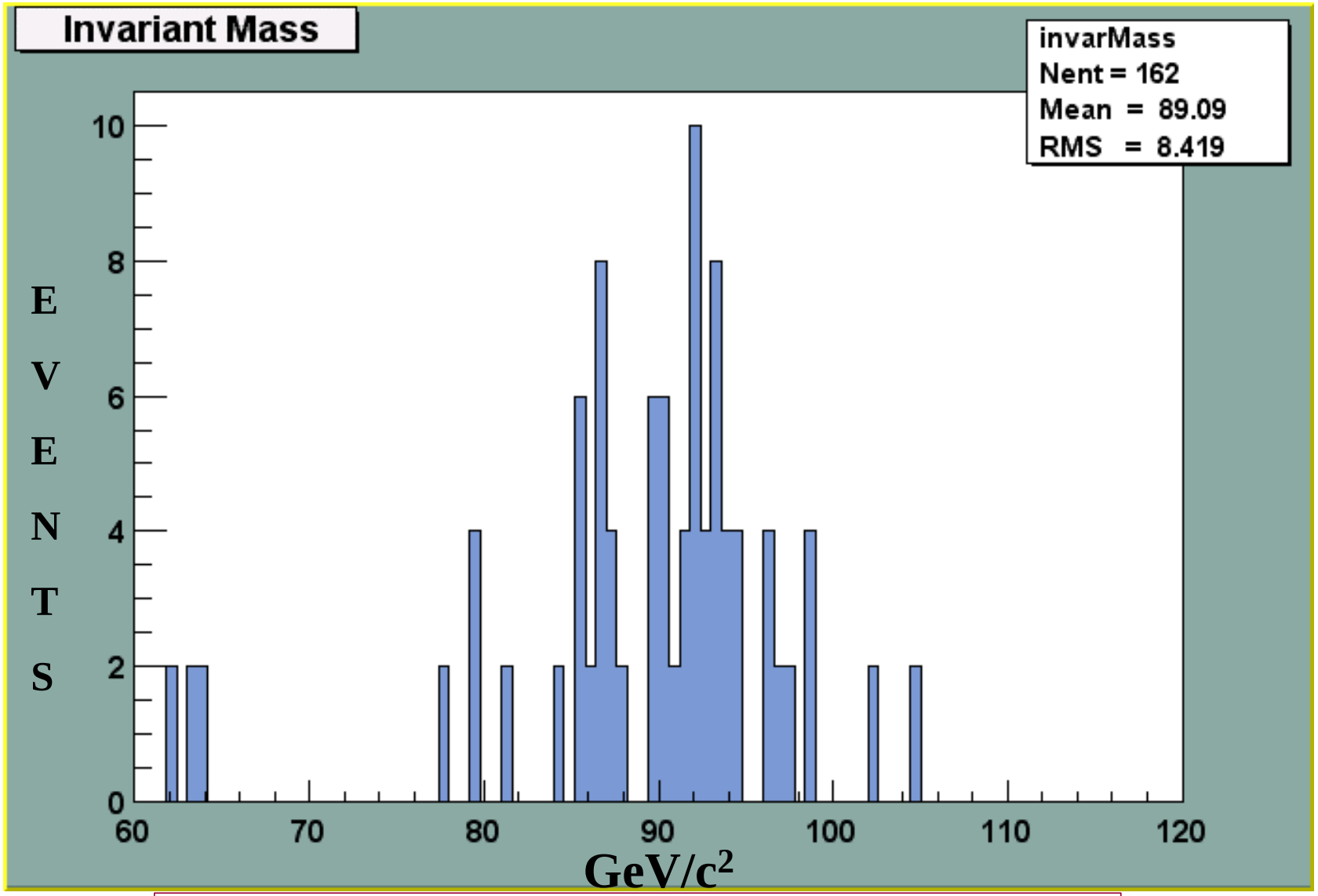
Tight Cuts (1st electron)

- |?| < 1.1 (central e)
- E_T > 20 GeV
- P_T > 10 GeV
- Total Iso < 4 GeV
- E_{had}/E_{em} < .055 + .00045*E
- 0.5 < E/P < 2.0
- Lshr < 0.2
- |? x| < 1.5 cm
- |? y| < 3.0 cm
- |? z_0| < 60.0 cm
- # Stereo hits > 20
- #Axial hits > 20
- FIDELE = 1

Loose Cuts (2nd electron)

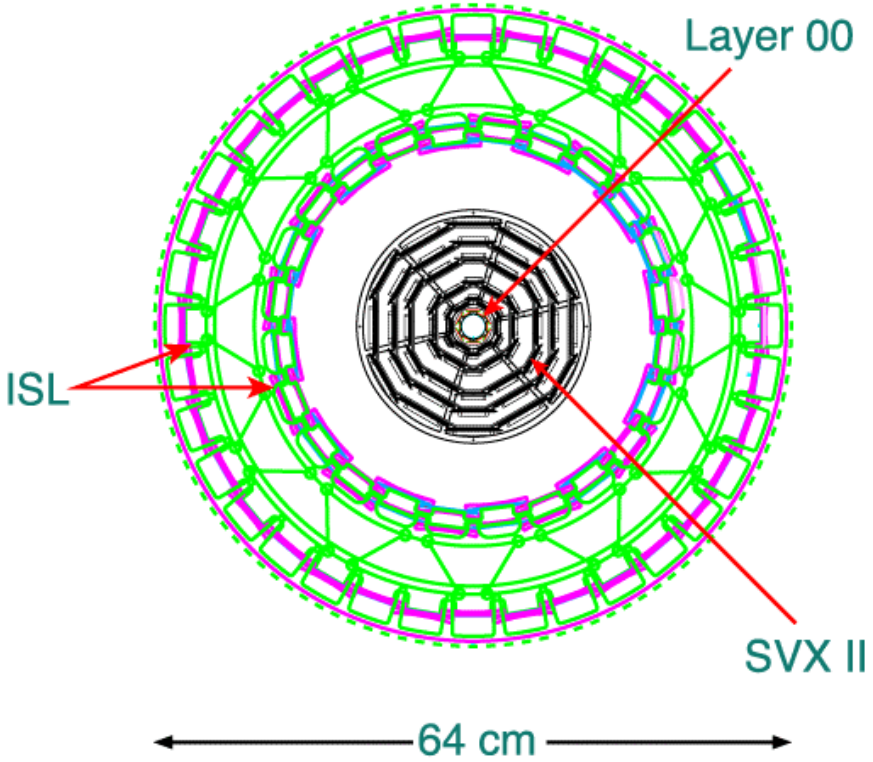
- |?| < 1.1 (central e)
- E_T > 20 GeV
- Total Iso < 4 GeV
- E_{had}/E_{em} < 0.1
- E/P < 3
- Opposite charge

Invariant Mass from Z? ee



CAEN Power Supplies

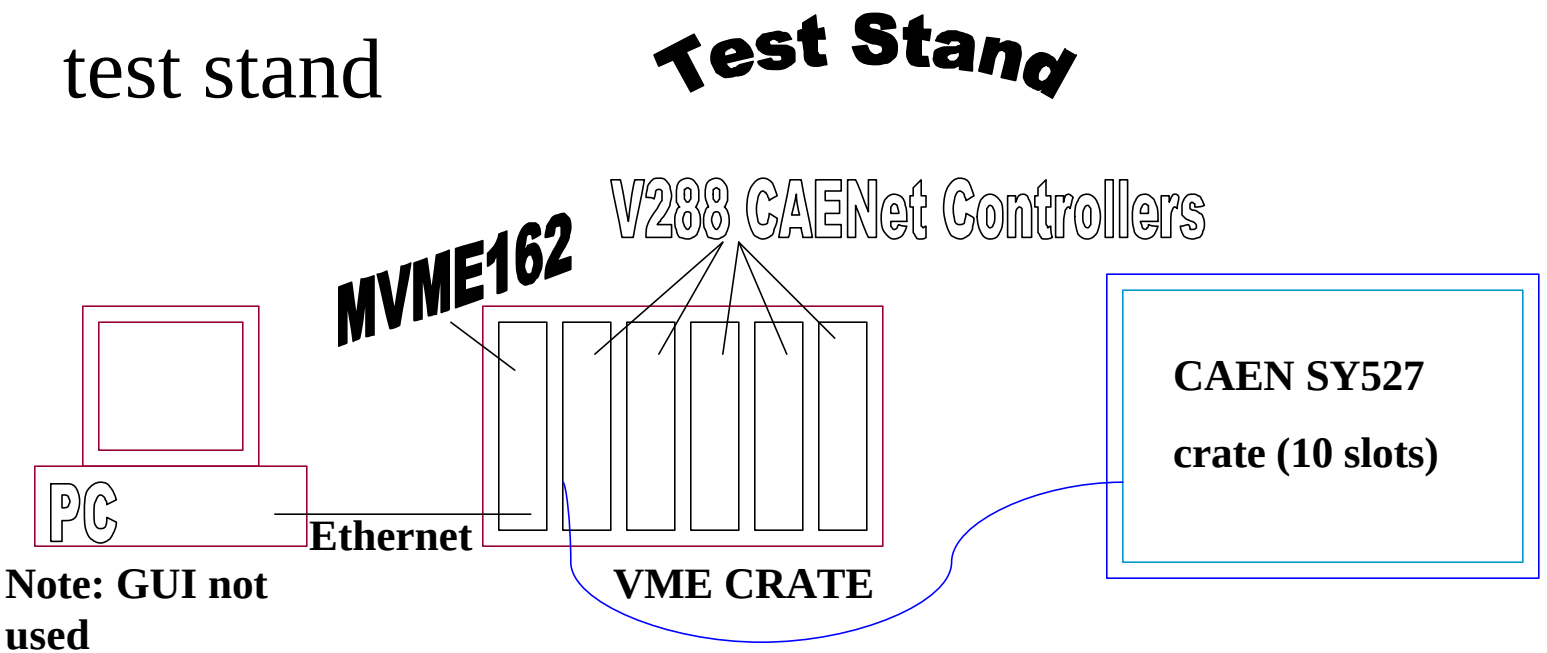
- Power supplies and crate manufactured by Italy based CAEN
- Three different types of power supplies. One for each type of silicon layer in the CDF detector. The 3 layers are ISL, SVXII, L00



- Silicon Layers allow excellent precision in tracking, need all channels working for this benifit

Investigating Spontaneous Transitions

- 'Spontaneous transitions', which is when a channel either turns spontaneously on or off, prevent data from being read during a run
- Want to understand this problem better, set up test stand

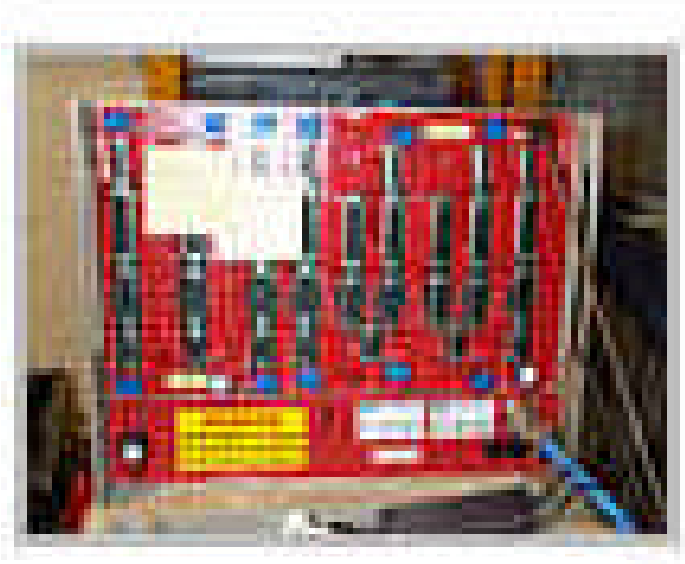


Using the Test Stand

- Modified preexisting code, added routine to simulate conditions conducive to Spontaneous Transitions
- Everything wrote out to log file
- Used this strategy to look for patterns in spontaneous transitions

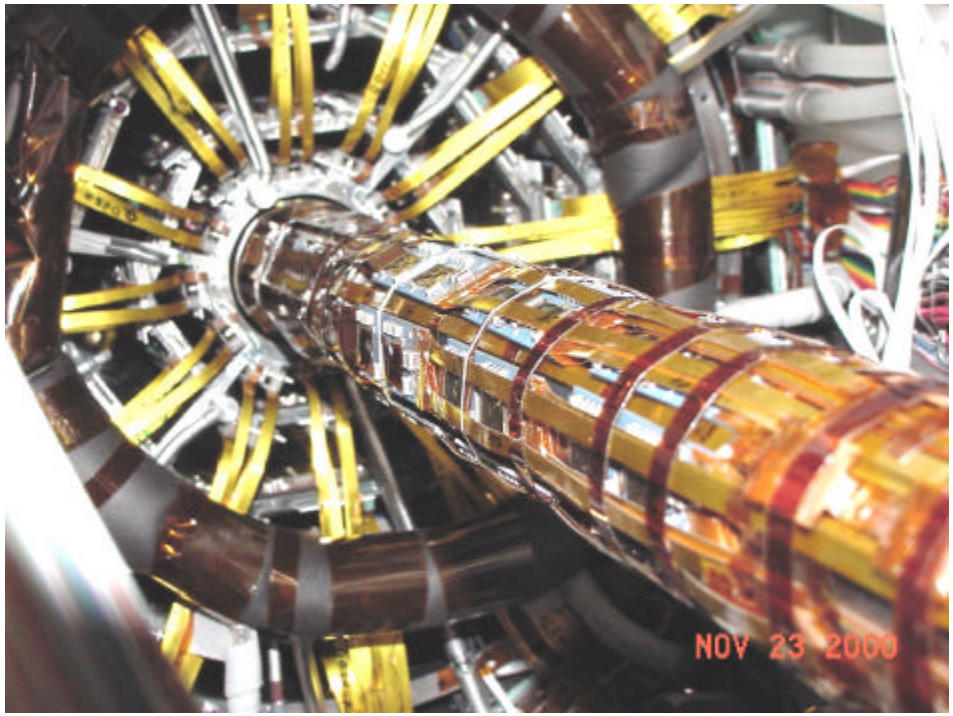
What did I find?

- Channels turning spontaneously off, channels spontaneously turning on were not observed
- No noticeable pattern observed, can occur to any channel in any board with any length of delay between communications
- No odd behavior in coincidence with transitions



Side Projects

- Wrote a help sheet to assist other people with getting started
- Wrote code to diagnose problems in power supplies



Conclusions

- Ntuple can be used to find Ws and Zs, but more corrections are needed
- Channels are not being “tripped” off in a standard way, i.e. overcurrent, overvoltage, etc.
- Problem happens in ISL, SVXII, and L00
- Spontaneous transitions are probably communication problems, possibly ‘cross talk’